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# Oyster Shoal Survey - Spring 1988

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**FILE**

Oyster Shoal Survey, Spring 1988

by

James P. Whitcomb

Virginia Institute of Marine Science

and

The College of William and Mary  
Gloucester Point, Virginia 23062

July 1, 1988

Virginia Marine Resource  
Report No. 88-6

## Oyster Shoal Survey

Spring 1988

James P. Whitcomb

The objective of the annual oyster survey in the Spring is to determine the bushel counts prior to fall harvest for seed and to assess the condition of market and seed oysters on selected shoals. The selection of the shoal is based upon the importance of the shoal as a source of seed and/or market oysters, whether it is representative of a region of the subestuary, and whether the shoal had been sampled in the past.

The sample unit was three samples on each station with a twenty-four inch (opening) dredge with three inch teeth, running either downcurrent or upcurrent on parallel tracks, and retention of a one-half bushel measured sample representative of each haul. An additional sample was taken if the relationship between the variances and the mean bushel counts fell outside an acceptable range. The acceptable range in variance was based upon experiential knowledge and principle. The principle has been described in a memo dated April 2, 1986 (see Appendix).

The data collection included: the count of market oysters (over 3" in length), the count of small oysters (less than 3" in length but larger than the previous year's set), the count of spat, the count of new boxes (attached shell clear of meat), count of old boxes, count of gapers (dying oysters still containing meat), list of predators, a description of fouling, bottom temperature, bottom salinity and observations of the condition of the oysters and the bottom. The data summary of each shoal included; the average count of oysters per bushel, the percent mortality based upon number of gapers and recent boxes, the percent mortality based upon numbers

of gapers and all boxes (old and recent), a list of predators retained in the dredge, a description of fouling; and a characterization of the reef as a "seed" oyster or "market" oyster reef. Seed oysters are small oysters including spat.

The mortalities of oysters in Virginia, caused by disease, have resulted in a shortage of "market" oysters and "seed" oysters. The only James River bar which produced seed counts was Horsehead. Although the bushel count there was below what is considered a good "seed count" (700 oysters per bushel) there are 237 small oysters per bushel at Horsehead. This is a marginal count for seed but the best available in the James River.

Since 1985 the James River has become the center of the "market" oyster landings in Virginia. For more effective monitoring a station has been added at Long Rock and a station has been added at Dry Shoal. In the spring of 1986 there was an average of 64 oysters  $\geq 3$ " on the combined bars above Brown Shoal. In the spring of 1987 this count dropped to 55 oysters  $\geq 3$ " in length. In this survey (spring 1988) the bars above the line of high mortalities (Wreck Shoal-Dry Shoal) averaged 24 oysters  $\geq 3$ ". In the same three year period the average count of set of oysters counted during the spring survey has remained low (40-55 spat per bushel).

The mortalities from, primarily, disease on James River bars has increased from a high of 7% in the spring of 1986 to 48-60 percent in 1987 and 1988. Mortalities remain high downriver of Wreck Shoal and Dry Shoal and low upriver of these bars. Surviving recruitment has remained low on all bars in this same three year period but the recruitment in the spring of 1988 at Ridge, the furthest station down river, was (76 spat per bushel) exceeded only by the set at Point of Shoals.

The bushel counts are below 100 oysters per bushel downriver from Wreck Shoal and Dry Shoal. Upriver of these same bars the bushel count has dropped from an average of 504 oyster per bushel (spring 1986) to 274 oysters per bushel (spring 1988). This drop in count is attributed to disease mortality plus exploitation by harvesting "market" oysters. The James River oysters bars are now marginal as a source of "seed" oysters and would be characterized as "spotty" if not marginal as a source of "market" oysters. The low number of surviving spat in the spring surveys since the spring of the 1986 has, in addition, characterized the James River as failing to match the losses in number of oysters with an equal recruitment of spat.

The York River station at Aberdeen Rock had an average bushel count of 24 oysters per bushel of cultch and 10 spat per bushel but no  $\geq 3$ " oysters. Pultz Bar the single station for Mobjack Bay had an average count of 9 oysters per bushel of cultch and no spat but two  $\geq 3$ " oysters per bushel. Both bars are classified as depleted.

The bars in the Piankatank River have continued to have substantial mortalities with low recruitment except at Palace Bar where surviving spat was 297 spat per bushel. But the count of small oysters at Palace Bar (108 per bushel) limits the use of the oysters for "seed". None of the bars will support the harvesting of  $\geq 3$ " "market" oysters.

With the exception of Broad Creek the counts of oysters per bushel of cultch for all the bars in the Rappahannock River ranged from 7 (Hog House Bar) to 63 (Bowlers Rock). All of the bars were either marginal or of no value for harvesting of "market" oysters ( $\geq 3$ " in length). Recruitment was low at all bars. The disease caused mortalities have been in recent years unexpectedly high above Towles Point except at Bowlers Rock.

Middle Ground was the only station in the Corrotoman River a tributary of the Rappahannock River. In the past two years bushel counts fell from 338 oysters per bushel (spring 1987) to 57 oysters per bushel (spring 1988). Mortalities, measured by all boxes, increased from 14 to 64 percent in the same period while spat numbered 21 per bushel (spring 1988). The disease, Perkinsus mar., appears to be epidemic now in the Corrotoman River.

The heavy set on sampled oyster bars in the Great Wicomico River, ranging from 336-1932 spat per bushel, masks the concurrent mortalities. The mortality of "market" (>3" in length) and small oysters at Fleet Point was 68 percent. Just 10 "market" (>3" in length) were collected in 10 samples from all of the bars. Although the spat per bushel averages 887 spat on all bars the number of small oysters decreased 56 percent in one year. Haynie Bar was classified as very good as a source of "seed" but the remaining sampled bars were below average.

Four bars in Pocomoke Sound were not sampled because they were classified as depleted in the previous fall survey. The two remaining stations P.G. #9 and P.G. #10 had, respectively; 76 and 87 percent mortalities. Bushel counts fell in one year at these stations, respectively; 147 to 35 and 230 to 7. Neither bar has enough oysters for harvesting of "markets".

TABLE 1. SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS			BU. COUNT	$\bar{x}$ COUNT	GAPER	BOXES		PRED.	FOULING	°C	‰	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC.
	MKT	SM	SPAT				REC	OLD									
<u>JAMES RIVER</u>																	
Horsehead	16	228	20	264		0	0	10	mud crabs; few	barnacles; mod	15.2	8.8	1015			27346.0	Wind light.
	14	246	6	266		0	0	2	mud crabs; few	barnacles; mod						41333.2	
	36	238	16	290	273	0	0	4	mud crabs; few	barnacles; mod							barnacles dominant
Pt. of Shls.	18	202	138	358		0	24	12	Stylochus; few	barnacles; mod	15.0	9.2	1115			27344.0	Wind light
	34	238	212	484		0	26	16	mud crabs; few	mussels; few						41310.6	
	20	108	120	248		0	10	12	Odostomia								
	28	110	74	212	326	0	8	0									barnacles dominant
Long Rock	24	140	10	174		0	2	14	mud crabs	very light	15.2	11.6				27338.4	Wind light
	36	198	14	248		0	14	16		fouling						41312.9	
	32	158	10	200		0	0	14									
	40	206	26	272	224	0	6	12									
Dry Shoal	14	56	26	96		0	2	72	mud crabs	barnacles; mod	15.3	14.1	1300		7'	27332.5	
	10	44	16	70		0	0	76		mussels; few						41302.3	
	28	64	30	122	96	0	2	116									
Wreck Shl.	12	50	40	102		0	2	64	mud crabs; few	very light	15.2	13.7	1315			27326.0	Wind light
	8	62	30	100		0	0	76	mud crabs; few	fouling						41301.8	
	12	30	34	76	93	0	2	86	mud crabs; mod.								

## SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS			BU.	$\bar{X}$	BOXES		OLD	PRED.	FOULING	°C	‰	TIME	TIDE	$\bar{X}$	LORAN	OBSERVATIONS
	MKT	SM	SPAT	COUNT	COUNT	GAPER	REC								DEPTH	COORD.	SAMPLE PREC., ETC
Thomas Rk.	8	22	38	68		0	10	132	mud crabs	Alcyonidium;	15.0	16.3	1050	Max flood	10'	27302.7	Seas calm
	12	28	76	116		0	6	84		heavy. hydroids,							41218.8
	4	18	62	84		0	6	146		Molgula barnacles, mussels							
Ridge	8	16	64	88	89	0	10	132									
	4	28	130	162		0	6	72	mud crabs	hydriods, barnacles.	15.0	17.7	1000	Max flood	7'	27280.6	Wind light
	6	20	110	136		0	0	66		Molgula, Anomia,						41218.8	Seas calm
	2	14	38	54		0	4	34		sponge; light							
	6	12	26	44	99	0	6	34									
<u>York River</u>																	
Aberdeen	0	10	6	16		0	0	4	mud crabs	Cliona, Anomia	14.8	17.3	1000	Late flood	7'	27368.3	Wind E 7Kt
Rock	0	20	16	36		0	0	12	mud crabs	Hydrozoans,						41501.2	Seas calm
	0	12	8	20	24	0	0	6	mud crabs	Crepidula							
<u>Mobjack Bay</u>																	
Pultz Bar	0	4	0	4		0	0	26	mud crabs	serpulids;	15.2	19.9	1300	Early ebb	12'	27310.6	Calm
	2	8	0	10		0	2	46	mud crabs	Molgula; light						41534.6	serpulids
	4	10	0	14	9	0	0	36	mud crabs	bryozoan, Anomia sponge							dominant
<u>Piankatank R.</u>																	
Ginney Pt.	10	82	84	176		0	26	160	mud crabs	mussels,	15.6	15.2	1230	Early flood	7'	27347.2	
	16	102	68	186		0	12	98		barnacles and						41659.6	
	10	94	92	196	186	0	34	110		Microciona							
Palace Bar	0	156	470	626		0	60	24	mud crabs	Microciona,	16.0	15.2	1030	Slack before	9'	27338.0	Calm
	0	98	206	304		0	36	30	mud crabs	hydriods; heavy				flood		41658.0	Microciona
	2	44	140	186		0	14	30	mud crabs	worms, Odostonia							dominant
	4	134	372	510	407	0	50	28	mud crabs								



## SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS			BU. COUNT	$\bar{X}$ COUNT	BOXES		OLD	PRED.	FOULING	°C	‰	TIME	TIDE	$\bar{X}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC
Burton's Pt.	0	2	2	4		0	0	56	mud crabs	Microciona,	16.0	15.7	1000	Late ebb	9'	27326.4	Calm
	0	0	6	6		0	0	32	oyster drills	serpulids, bryozoan. Crepidula yellow sponge						41652.3	
	0	0	10	10	7	0	0	10									
<u>Rappa. R.</u>																	
Bowler's Rk.	6	6	14	26		0	2	10		barnacles,	17.0	8.1	1325	Max ebb	9	27472.4	Seas 1 <sup>1</sup> / <sub>2</sub> to 2'
	44	30	40	114		0	2	6		mussels						41847.3	
	30	14	20	64		0	2	6									
	16	20	12	48	63	0	4	2									
Morattico	12	30	0	42		1	2	20	mud crabs	Molgula; heavy	16.2	12.1	1220	Early ebb	13'	27446.8	Windy SW
	14	6	0	20		0	2	18		mussels, barnacles						41818.6	
	8	8	0	16	26	0	2	24		anemones; light							Molgula dominant
Smokey Pt.	22	34	2	58		0	0	76	mud crabs	Molgula,	15.8	13.6	1115	Early ebb	12'	27418.1	Wind SW mod.
	18	30	0	48		0	2	102		mussels; mod						41779.9	Seas 1 <sup>1</sup> / <sub>2</sub> -2'
	30	32	0	62	56	0	2	86		hydriods, barnacles,							
Hog House	0	2	0	2		0	0	40	mud crabs	anemones; light						27398.3	Molgula dominant
	0	10	0	10		0	0	66		Molgula; heavy	18.0	14.1				41725.8	Black shell abund
	0	8	0	8	7	0	0	34									
Drumming Gnd.	0	42	10	52		0	0	50	mud crabs	mussels, sponges	17.5	14.6				27377.8	
	2	24	18	44		0	0	38		tunicates, barnacles						41738.1	
	0	20	28	48	48	0	0	62		hydroids							
Parrot Rk.	0	26	14	40		0	0	28	mud crabs	Microciona,	17.0	15.3				27361.9	
										tunicates,							
	0	22	26	48		0	0	36		bryozoan,						41710.4	
	0	44	26	70	53	0	0	40		mussels and							
Broad Ck.	0	56	48	104		0	0	108	mud crabs	barnacles						27329.5	barnacles
	2	76	84	162		0	0	96	Stylochus	barnacles; heavy	16.5	16.0				41696.3	dominant
	2	124	94	220		0	0	96		Molgula, mussels,							
	2	98	88	188	169	0	2	100		anemone							

## SUMMARY, SPRING 1988 OYSTER BAR SURVEY

AR	MKT	OYSTERS SM SPAT	BU. COUNT	$\bar{x}$ COUNT	BOXES GAPER REC	OLD	PRED.	FOULING	$^{\circ}\text{C}$	$^{\circ}/_{\text{oo}}$	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC.		
Corrotoman R.																	
Middle Gnd.	0	46	24	70		0	10	96	mud crabs	Molgula,	18.8	14.5	1200	Ebb	11'	27386.2	Wind, light
	2	32	26	60		0	2	74		Hydroides; light					41763.0	Seas calm	
	0	26	14	40	57	0	16	102	blood clams and mussels								
r. Wicomico																	
Baynie Pt.	2	252	458	712		0	104	148	mud crabs	barnacles,	18.8	14.5	1415	Early flood	5'	27366.4	Calm
	2	238	626	866		0	136	102	Stylochus	mussels; mod. Molgula, Gracilaria; light, algae					41871.4	30-40% shells were black	
Haleys' E.	0	208	368	576	718	0	164	124									
	0	74	792	866		2	74	54	Stylochs	barnacles,	18.0	14.7	1300	Early flood	10'	27361.0	Wind SE light
	2	124	540	666		1	104	58		hydroids; light					41866.7	Calm	
Beet Pt.	0	48	450	498		0	26	38		mussels, Gracilaria						30-40% shells were black	
	4	88	336	428	615	0	40	66									
	0	62	1932	1994		0	120	50	mud crabs	bryozoans,	16.8	15.6	1145	Low slack	10'	27358.2	Wind light
	0	42	1566	1608		0	62	38	Stylochus	Molgula barnacles, mussels					41868.1	Calm	
0	76	1804	1880	1827	0	30	74										
ocomoke Snd																	
.G. #9	10	22	12	44		0	12	106	mud crabs	Molgula; heavy	20.5	14.3	1350	Max ebb	7'	27222.6	Wind light
	10	14	2	26		0	12	90	numerous	Sabellidae; mod barnacles,					42011.3	Seas light	
	14	20	0	34	35	0	0	114	Stylochus numerous	bryozoans anemones, blood clams, Lyonsia; few						Molgula dominant	
.G. #10	0	2	4	6		0	2	48	mud crabs	Molgula,	19.0	15.4	1410	Max ebb	6 1/2'	27230.8	Wind S. light
	2	4	2	8	7	0	0	40	numerous	Hydroides, bryozoan, Sabellidae; mod Lyonsia; few					41999.3	Seas light	

TABLE 2. Bushel count and condition of oysters on each bar.

Bar	Average Bu. Count	Percent Mortality based upon		Evidence of Predation	Fouling	Classification
		Recent Boxes and Gapers	All Boxes and Gapers			
<u>James River</u>						
Horsehead	273	0	>1	mud crabs	barnacles; mod	seed; below average
Pt. of Shls.	326	5	8	mud crabs, Stylochus, Odostomia	barnacles; mod	seed; below average
Long Rock	224	2	8	mud crabs	mussels; few	seed; below average
Dry Shoal	96	3	49	mud crabs	very light fouling	seed; below average
Wreck Shoal	93	1	45	mud crabs	barnacles; mod	seed; below average
Thomas Rk.	89	8	60	mud crabs	mussels; few	seed; below average
					very light fouling	seed; below average
					Alcyodidum; heavy	seed; below average
					hydroids, barnacles	
					Molgula and mussels	
Ridge	99	4	36	mud crabs	hydroids, barnacles, seed; below average	
					Molgula, Anomia, sponge; light	
<u>York River</u>						
Aberdeen Rk.	24	0	23	mud crabs	Cliona, Anomia hydroids, and Crepidula	depleted
<u>Mobjack Bay</u>						
Pultz Bar	9	7	80	mud crabs	serpulids; heavy Molgula; light bryozoan, Anomia, sponge	depleted

BusHEL count and condition of oysters on each bar.

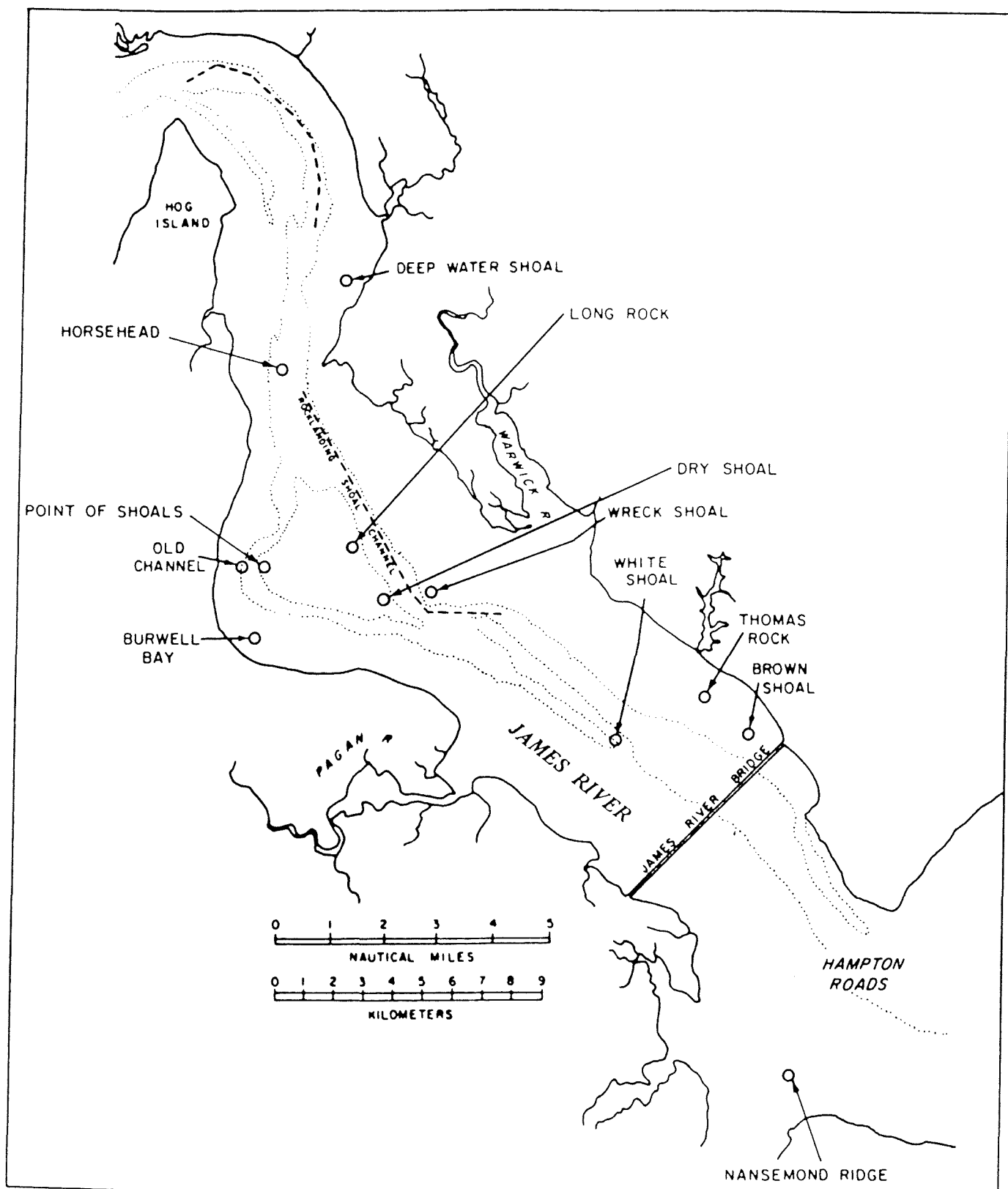
Bar	Average Bu. Count	Percent Mortality based upon		Evidence of Predation	Fouling	Classification
		Recent Boxes and Gapers	All Boxes and Gapers			
<u>Piankatank R.</u>						
Ginney Point	186	11	44	mud crabs	mussels, barnacles and Microciona	market, 6% markets
Palace Bar	407	9	14	mud crabs	Microciona, hydroids; heavy. barnacles, tubeworms, and Odostomia	seed; below average
Burton's Pt.	7	0	82	mud crabs oyster drills	Microciona, serpulids, Bryozoan Crepidula, and yellow sponge	market; poor
<u>Rappa. R.</u>						
Bowler's Rk.	63	4	12	mud crabs	barnacles, mussels	market; 38% markets.
Morattico	26	8	47		Molgula; heavy mussels, barnacles anemones; light	market; 44% markets.
Smokey Pt.	56	2	54	mud crabs	Molgula, mussels; mod. hydroids, barnacles, anemones; Light	market; 42% markets.
Hog House	7	0	87	mud crabs	Molgula; heavy	market; poor
Drumming Gnd.	48	0	51	mud crabs	mussels, sponges tunicates, barnacles, hydroids	market; poor
Parrot Rk.	53	0	39	mud crabs	Microciona, tunicates, bryozoans, mussels and barnacles	market; poor
Broad Ck.	169	>1	37	mud crabs, Stylochus	barnacles; heavy Molgula, mussels and anemone	market; poor
<u>Corrotoman R.</u>						
Middle Gnd.	57	14	64	mud crabs	Molgula, hydroides; light blood clams & mussels	market; poor

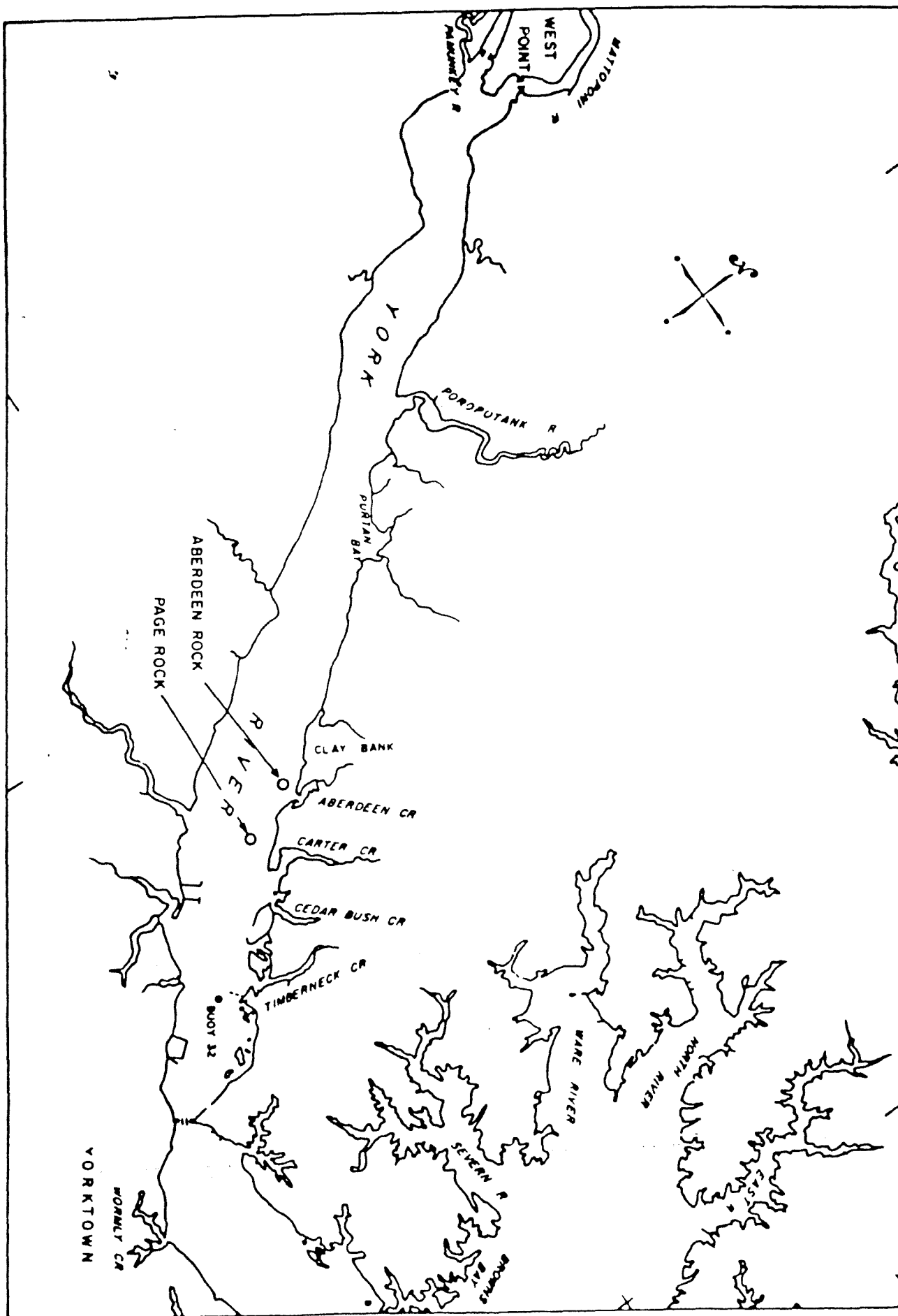
Bushel count and condition of oysters on each bar.

Bar	Average Bu. Count	Percent Mortality based upon		Evidence of Predation	Fouling	Classification
		Recent Boxes and Gapers	All Boxes and Gapers			
<u>Gr. Wicomico R.</u>						
Haynie Pt.	718	16	16	mud crabs, Stylochus	barnacles, mussels mod. Molgula, Gracilaria; light algae	seed; very good
Whaley's E.	615	9	16	Stylochus	barnacles, hydroids; light, mussels and Gracilaria	seed; below average
Fleet Pt.	1827	4	6	mud crabs, Stylochus	bryozoan, Molgula barnacles, and mussels	seed, below average
<u>Pocomoke Snd.</u>						
P.G. #9	35	19	76	mud crabs, Stylochus; numerous	Molgula; heavy Sabellidae; mod. barnacles, bryozoans anemones, blood clams, Lyonsia; few	market; poor
P.G. #10	7	13	87	mud crabs; numerous	Molgula, hydroides, bryozoan, Sabellidae; mod. Lyonsia; few	market; poor

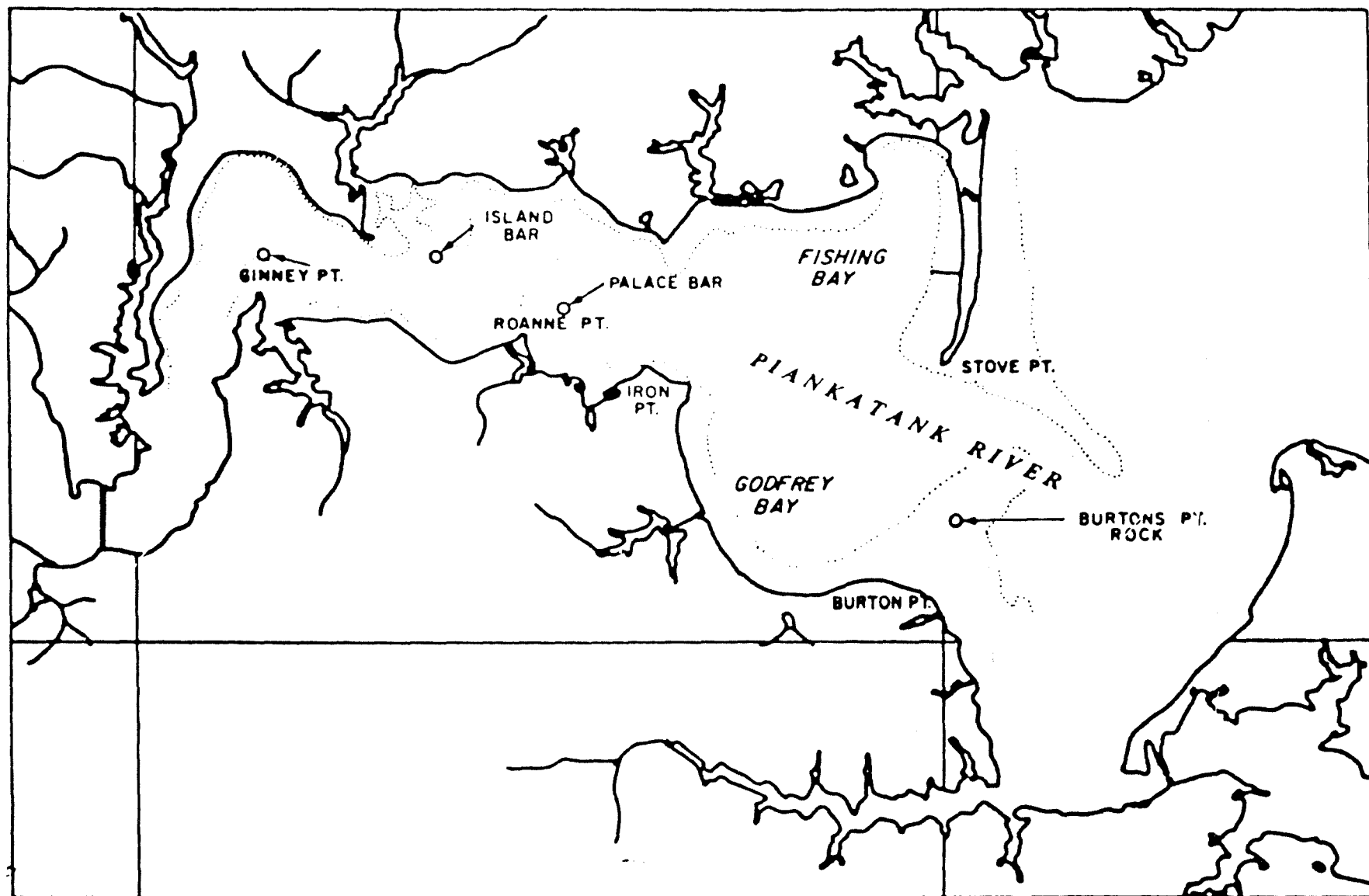
## APPENDIX

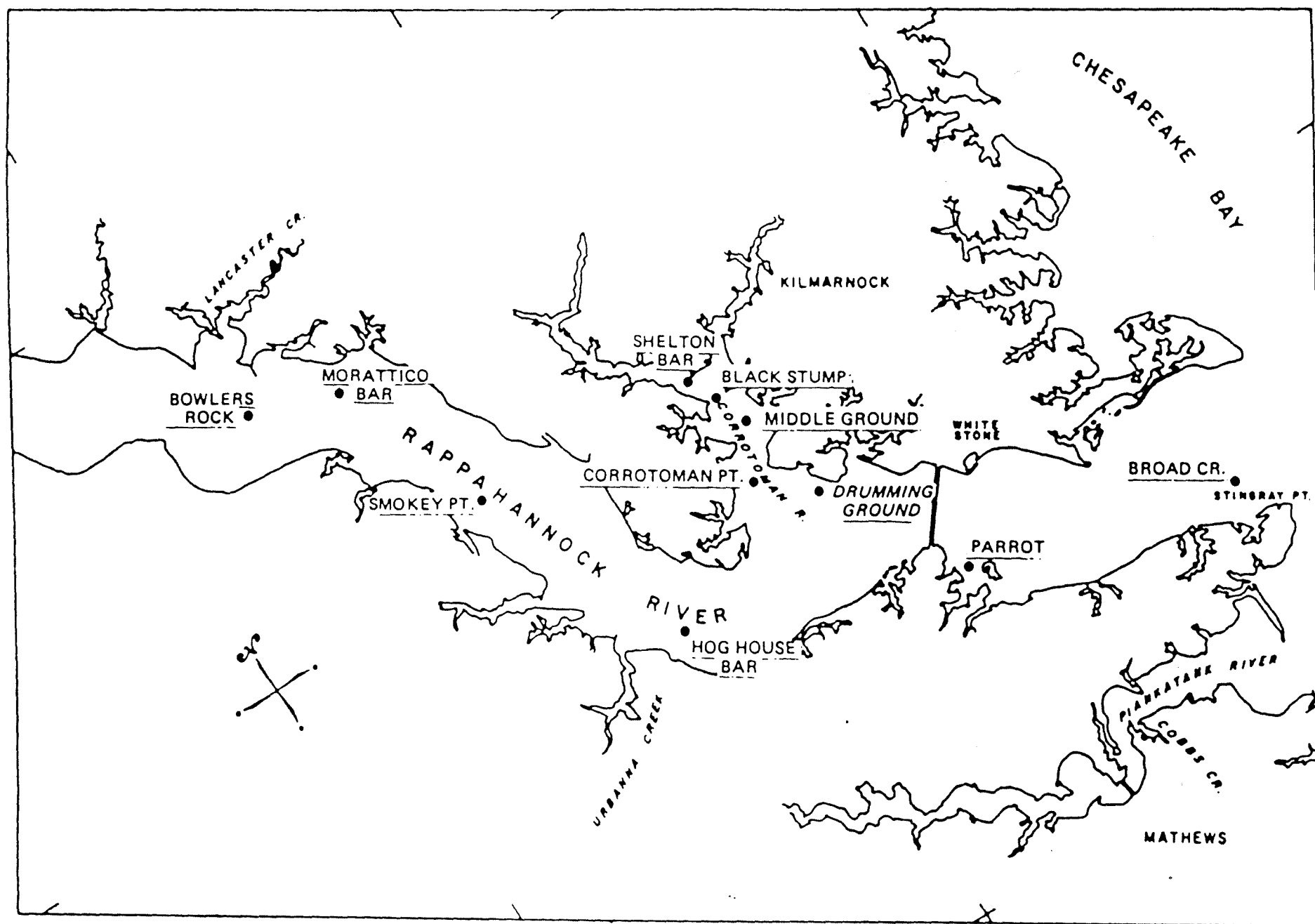
Locations of stations in the rivers in the spring 1988.

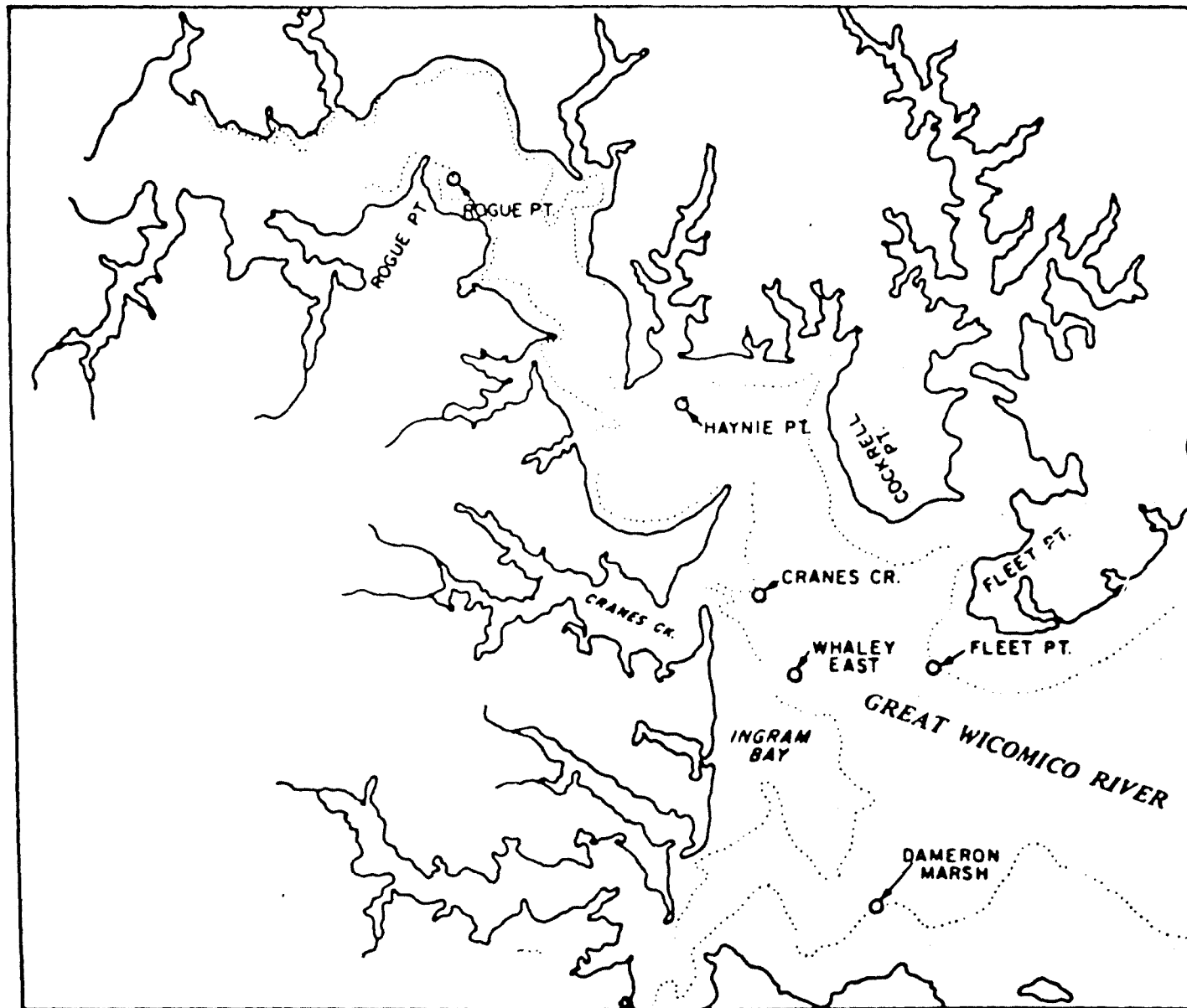


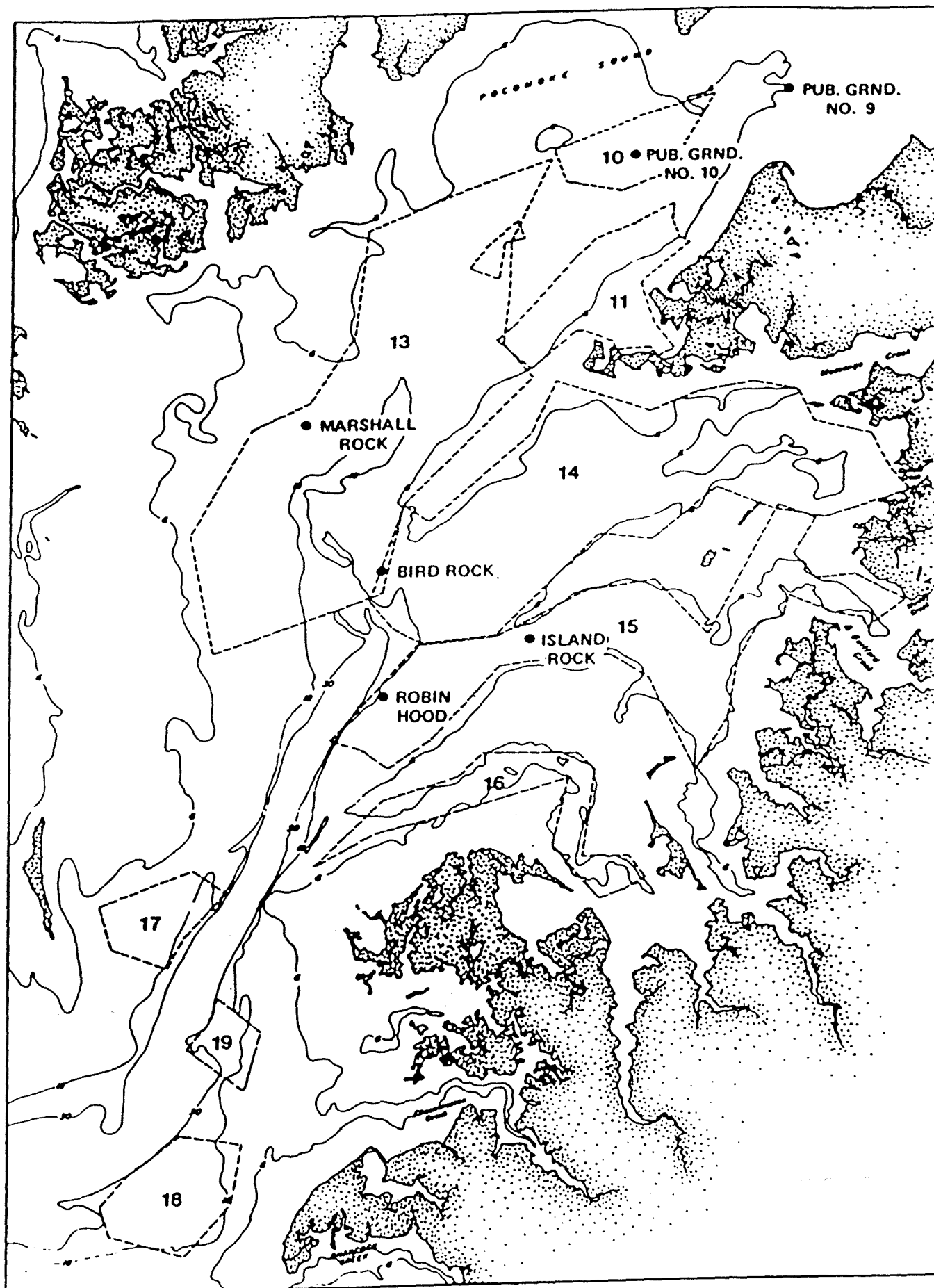












# MEMO

TO: Dr. H. Austin  
 THRU: Dr. R. Mann  
 FROM: J. Whitcomb  
 SUBJECT: Bottom survey on oyster shoals in the spring.  
 DATE: April 2, 1986

The purpose of the spring oyster shoal survey will be to estimate the count of oysters per bushel and the condition of the oysters on selected shoals. Selection of the shoal is based upon the importance of the shoal as a source of seed and/or market oysters, whether it is representative of a region of the subestuary, and whether the shoal has been sampled in the past.

The sample unit is three samples on each station with a twenty-four inch (opening) dredge with three inch teeth, running either with or against the current on parallel paths, retaining a one-half bushel measured sample representative of each haul. Additional samples will be taken if the relationship between the variances and the mean bushel counts falls outside an acceptable range. The acceptable range in variance is based upon experiential knowledge and principle. The principle is found in the statement that the index of precision equals the standard error divided by the average. Using an assumed precision of 20% and the equation,

$$D = 1/\bar{X} \left( \frac{S^2}{N} \right)^{1/2}$$

where D is the assumed precision,  $\bar{X}$  is the arithmetic mean ( or bushel count ),  $S^2$  is the sample variance, and N is the number of samples, we have an understanding of the relationship between the sample variance and the mean ( bushel count ).

$$0.2 = 1/\bar{X} \left( \frac{S^2}{N} \right)^{1/2}$$

$$N = \frac{S^2}{0.2^2 \bar{X}^2} = 25 \frac{S^2}{\bar{X}^2}$$

using N = 1 we have,

$$\bar{X}^2 = 25 S^2$$

The line representing this relationship is shown in Fig. 1. If the ranges are plotted at each mean count value we have constructed a zone of acceptability as is shown by the dashed lines. As samples are taken the composite mean is plotted against an estimate of the variances to determine if additional samples are required.

The data collection includes: count of market oysters ( over 3" in length ), count of small oysters ( less than 3" in length but larger than the previous year set ), count of spat, new boxes, old boxes, gapers, the bottom temperature, bottom salinity and observations relative to the condition of the oysters, water column and bottom. For each station the data summary will consist of average bushel counts exclusive of spat, spat count, mortality based upon new boxes and gapers, number of predators by species, and description of fouling. The loran reference numbers will be recorded at each station.

Each shoal will be classified as either a seed or market shoal. Then it will be rated as Excellent, Satisfactory or Below Average with an explanation.

